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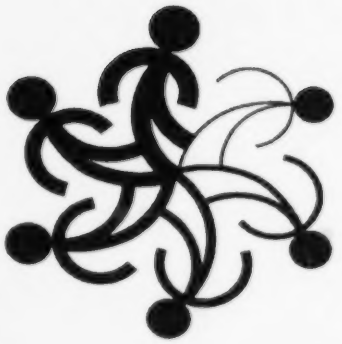
Aggressive Behaviour Outcomes for Young Children: Change in Parenting Environment Predicts Change in Behaviour



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Aggressive Behaviour Outcomes for Young Children: Change in Parenting Environment Predicts Change in Behaviour

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Abstract

This study used data from the National Longitudinal Survey of Children and Youth (NLSCY) to examine change in punitive parenting and child aggression. The study confirmed previous research by finding links between harsh, punitive parenting and child aggressive behaviour, both at age 2 to 3 years and at age 8 to 9 years. Children living in punitive environments scored higher in aggressive behaviour than those living in less punitive environments at both ages. This relationship appeared for both genders, for low-income and higher-income families, and for all regions of Canada. The study found that some children experienced parenting practices at age 2 to 3 years that were different from the parenting practices they experienced six years later, at age 8 to 9 years, and that these parenting changes were associated with behaviour changes. Children whose early parenting environment had been punitive but whose environment became less so scored as low in aggressive behaviour as those whose parenting environment was non-punitive at both ages. Likewise, children whose early parenting environment had been non-punitive but whose environment became more punitive over the course of the six years scored just as high in aggressive behaviour as those whose parenting environment was punitive at both ages.

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1. Objective

The objective of this report is to present information about aggressive behaviour outcomes at age 8 to 9 years of children in the National Longitudinal Survey of Children and Youth (NLSCY), in light of changes over a six-year period in their parenting environments.

2. Background and rationale

Aggressive behaviour in young children has been of considerable interest to researchers because of its implications for future behaviour and adjustment. Aggression in childhood has been linked with later aggression, delinquency, and crime in adolescence and adulthood; with poor school outcomes; with unemployment in adulthood; and with other negative circumstances (e.g., Broidy et al. 2003; Koko and Pulkkinen 2000; Loeber and Hay 1997; Nagin and Tremblay 1999).

Some young children are at higher risk than others for future emotional and behavioural difficulties, including aggressive behaviour. A substantial body of work has identified key dimensions in the early home environment, such as parenting practices, that are linked to favourable and unfavourable cognitive, social and behavioural outcomes (e.g., Chao and Willms 2002). This is especially true for aggressive behaviour in children: convincing links have been found between harsh, punitive parenting attitudes and practices on the one hand and aggressive behaviour on the other (e.g., Ackerman, Brown and Izard 2003; Brennan et al. 2003; Conger et al. 1994; Deator-Deckard et al. 1996; Pettit, Bates and Dodge 1997; Tremblay et al. 2004).

Externalizing behaviour, including hostile, aggressive and antisocial actions, is more prevalent among children in disadvantaged populations than others (e.g., Conger et al. 1994; Duncan, Brooks-Gunn and Klebanov 1994; McLoyd 1998). A family stress perspective adopted by some researchers proposes that the association between poverty and problem behaviour is partly explained by harsh parenting practices arising from the stress of living in poverty (Dodge, Pettit and Bates 1994; Forgatch and DeGarmo 1999; Linver, Brooks-Gunn and Kohen 2002; McLeod and Shanahan 1993, 1996; McLoyd 1998; Miller, Jenkins and Keating 2002).

Changes in the home situation, such as changes in income status or family structure, have been studied extensively, and these changes, whether for the better or for the worse, have been found to be linked to outcomes (e.g., Duncan, Brooks-Gunn and Klebanov 1994; Macmillan, McMorris and Kruttschnitt 2004). However, changes in such home environment variables as parenting practices have not been examined.

The purpose of the present research project was to study change in the home environment and behaviour of young children; specifically, the project examined differences from age 2 to 3 years to age 8 to 9 years in punitive parenting practices and children's aggressive behaviour. The longitudinal nature of the NLSCY allows for an assessment of change in home environment variables, like parenting practices, and of links between change and child behaviour outcomes. This study focussed on change in harsh, punitive parenting practices and aggressive behaviour

outcomes, mainly physical aggression, in children. Low income status was examined in the present report to determine whether parenting practices predicted behaviour independently of income. Child gender and regional differences in parenting practices and aggressive behaviour were also examined.

Research questions

The specific research questions being investigated were:

1. Does a parenting environment that includes punitive parenting practices predict concurrent aggressive behaviour in children?
2. Are the relationships between punitive parenting practices and child aggressive behaviour dependent on child gender, low income status, or region of residence, and/or do parenting practices alone predict behaviour after accounting for child gender, income status and region?
3. Is change in parenting environment linked to later behaviour? Specifically:

    a. Does an early parenting environment that includes punitive parenting practices predict aggressive behaviour in children six years later, even when the parenting environment has become less punitive?
    b. Similarly, are the links between non-punitive parenting and low levels of child aggressive behaviour persistent over six years when the parenting environment has remained unchanged or when it has become more punitive?

3. Methods and procedures

Participants

The children studied here were 1,967 members of the first longitudinal cohort of the NLSCY, who were 2 to 3 years of age during the 1994 data collection phase of the survey and aged 8 to 9 years of age during the 2000 collection phase. These children represented 667,000 children in the Canadian population. An overview of the NLSCY appears in Appendix A, along with an explanation of the derivation of the sample used in this study.

Measures: Predictor variables

Demographic variables. The predictor variables of interest in this study included basic demographic variables. Child gender was considered, as was child age at each stage of the survey (whether 2 or 3 years old in the 1994 cycle and 8 or 9 years old in the 2000 cycle). Household income status was measured as the ratio of household income to the low-income cut-off (LICO) for the size and location of the child's household in 1994 and in 2000. Income status was analyzed as a two-level variable, low income (ratio of income to LICO was less than 1) and higher income (ratio of income to LICO was equal to or greater than 1). Region of residence included five regions for this analysis: 1) Atlantic region, comprising Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick; 2) Quebec; 3) Ontario; 4)

Prairie region, comprising Manitoba, Saskatchewan and Alberta; and 5) British Columbia. Details about the demographic measures appear in Appendix B.

Parenting environment predictor variables. The parenting practices variables in the survey were formed using scales that included responses to a set of individual items. The parenting variables of interest in this study were the measures of punitive parenting practices, which were collected at both time points, when the children were aged 2 to 3 (1994) and 8 to 9 (2000). Details about the punitive parenting practices scales appear in Appendix B.

Two-level punitive parenting variables were created for the 1994 and 2000 parenting scales. The "non-punitive" categories in these variables included cases with punitive parenting scores below a division point that was near the 90th percentile on the punitive parenting scales, while the "punitive" categories included cases with scores above that level. Details about the two-level punitive parenting variables appear in Appendix B.

Parenting environment change variable. To study change in the parenting environment, a 4-level punitive parenting change variable was computed from the two-level punitive parenting variables. The four parenting change categories included:

1. Non-punitive 1994 and 2000: These were cases where parenting practices were non-punitive in both 1994 and 2000.
2. Changed to punitive 1994 to 2000: These were cases where parenting practices were non-punitive in 1994 but punitive in 2000.
3. Changed to non-punitive 1994 to 2000: These were cases where parenting practices were punitive in 1994 but non-punitive in 2000.
4. Punitive 1994 and 2000: These were cases where parenting practices were punitive in both 1994 and 2000.

Details about the parenting environment change variable appear in Appendix B.

Measures: Outcome variables

Child aggressive behaviour. Child aggressive behaviour was the outcome variable studied here. In both 1994 and 2000, the person most knowledgeable about the child, usually a parent, was asked questions about child aggressive behaviour. These questions were used to develop two different aggressive behaviour scales, one for each of the two ages. It is important to note that change in child aggressive behaviour between 1994 and 2000 cannot be examined directly by comparing scores on these scales. Although the scales for 1994 and for 2000 assess a similar underlying concept, namely, aggressive tendencies in child behaviour, they are based on different questions, and the number of items in the scales also differs. Therefore, the scores are not directly comparable. Details about the child aggressive behaviour scales are presented in Appendix B.

Data analysis

Links between the behaviour outcome variable – child aggressive behaviour - and the principal predictor variable - punitive parenting change - were assessed using linear regression procedures. The analysis investigated the links between the parenting change variable and the behaviour outcome measure in 2000, controlling for 1994 behaviour. This approach allowed for an assessment of whether differences in the environment between 1994 and 2000 were linked to differences in behaviour. A description of the data analysis procedures appears in Appendix C.

4. Results

Population descriptive statistics

The percentages and numbers of respondents in various demographic categories (with standard errors of the percentages) appear in Table 1. The participants were 49% female and 51% male. In 1994, 46.5% were 2 years of age, while 53.5% were 3 years of age. In 2000 the age breakdown was 49% age 8 and 51% age 9. In 1994, 25% of the group were low-income, as defined above, while the figure was 18% in 2000. Finally, the region of residence in 2000 was 8% Atlantic region, 25% Quebec, 37% Ontario, 19% Prairie region, and 12% British Columbia.

Findings

The frequency distributions of scores on the child aggressive behaviour and punitive parenting practices scales for 1994 and 2000 appear in Appendix D (Tables D1 to D4). Mean scores are presented in Table 2, by child gender, household income status in 1994 and 2000, and region of residence.

Child aggressive behaviour. The overall mean score on the child aggressive behaviour scale for 2- to 3-year-olds (1994) was 5.2 (standard error = 0.10). The overall mean on the child aggressive behaviour scale for 8- to 9-year-olds (2000) was 1.3 (standard error = 0.06). The fact that the aggressive behaviour scores were higher at age 2 to 3 than at age 8 to 9 reflects the differences in the two scales, at least in part, and should not be interpreted as measuring differences in behaviour. It should be noted, however, that the lower aggression scores at age 8 to 9 are consistent with what is known from other research about change in behaviour over the preschool years, a period when aggressive behaviour has been found to decline (Hay, Castle and Davies 2000; Tremblay et al. 2004).

Punitive parenting practices. The overall mean score on the punitive parenting practices scale was 5.2 (standard error = 0.08) when the children were aged 2 to 3 years and 4.4 (standard error = 0.06) when they were aged 8 to 9 years, indicating that overall, the parents of children in the sample reported punitive parenting scores that were 15% lower when the children were aged 8 to 9 than when they were aged 2 to 3.

Table 1
Percentage (standard error) and number of children by demographic category

		% (SE)	Population N
Child gender	F	49.2 (0.75)	328,400
	M	50.8 (0.75)	338,600
Child age 1994	2 years	46.5 (1.11)	310,100
	3 years	53.5 (1.11)	357,000
Child age 2000	8 years	48.7 (0.74)	324,800
	9 years	51.3 (0.74)	342,200
Household income 1994	Low	24.7 (1.67)	165,000
	Not low	75.3 (1.67)	502,000
Household income 2000[1]	Low	17.7 (1.66)	114,800
	Not low	82.3 (1.66)	535,300
	(missing)		(16,900)
Region of residence 2000	Atlantic	7.6 (0.24)	50,900
	Quebec	24.7 (0.62)	164,500
	Ontario	36.9 (0.89)	246,000
	Prairie	19.0 (0.60)	126,800
	B.C.	11.8 (0.55)	78,700
All		100.0	667,000

Notes:
Total sample n=1,967.
Population N has been rounded to the nearest 100.
1. n=1,925 (Low income cut-off was not available for a small number of children in 2000).
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Child gender. The figures in Table 2 show that parents rated girls and boys as equally aggressive, both in 1994 at age 2 to 3 years, and in 2000 at age 8 to 9 years. Although the mean aggressive behaviour scores for girls were slightly lower than those for boys at both ages, t-tests indicated that the differences between these means did not reach statistical significance at the .05 level. This finding for 2- to 3-year-olds is consistent with other studies that found that mothers' ratings of toddler aggression were the same for girls and boys (Hay et al. 2000). Similarly, parents of girls were somewhat less likely than parents of boys to report that they used punitive parenting practices, both in 1994 at age 2 to 3 years, and in 2000 at age 8 to 9 years, but the differences between the mean scores did not reach statistical significance at the $p<.05$ level.

Table 2
Mean scores (standard errors) for predictor and outcome variables, by child gender, income status, and region

		Child aggressive behaviour 1994 age 2-3	Child aggressive behaviour 2000 age 8-9	Punitive parenting 1994	Punitive parenting 2000
Child gender	F	5.0 (.15)	1.2 (.08)	5.1 (.11)	4.4 (.09)
	M	5.4 (.15)	1.4 (.08)	5.4 (.10)	4.5 (.09)
Household income 1994	Low	5.9 (.25)		5.5 (.18)	
	Not low	5.0 (.11)		5.1 (.09)	
Household income 2000[1]	Low		1.4 (.17)		4.4 (.19)
	Not low		1.3 (.06)		4.4 (.07)
Region of residence 2000	Atlantic	5.3 (.22)	1.4 (.11)	5.3 (.15)	4.6 (.14)
	Quebec	4.5 (.22)	1.2 (.14)	4.4 (.15)	3.7 (.13)
	Ontario	5.4 (.20)	1.3 (.09)	5.5 (.14)	4.8 (.11)
	Prairie	5.6 (.19)	1.5 (.12)	5.9 (.15)	4.5 (.14)
	B.C.	5.1 (.30)	1.4 (.17)	4.9 (.24)	4.5 (20)
All		5.2 (0.10)	1.3 (.06)	5.2 (.08)	4.4 (.06)

Notes:
Total sample n=1,967.

Observed ranges of scores were:
Child aggressive behaviour age 2-3 = 0 to 16 (maximum possible score = 16)
Child aggressive behaviour age 8-9 = 0 to 12 (maximum possible score = 12)
Punitive parenting for age 2-3 = 0 to 13 (maximum possible score = 16)
Punitive parenting for age 8-9 = 0 to 11 (maximum possible score = 16)

1. n=1,925 (Low income cut-off was not available for a small number of children in 2000).

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Results of the t-tests for gender differences in child aggressive behaviour scores and punitive parenting practices scores follow.

Child aggressive behaviour 1994: t = -1.65, p =.10
Child aggressive behaviour 2000: t = -0.20, p = .08
Punitive parenting practices 1994: t = -1.80, p = .07
Punitive parenting practices 2000: t = -0.92, p = .36

Income status. As indicated in Table 2, parents in low income households were more likely than others to report their children as aggressive in 1994 at age 2 to 3 years, but not in 2000 at age 8 to 9 years. No differences were found between low income parents and others in punitive parenting practices scores at either age. Results of the t-tests for income status differences in child aggressive behaviour scores and punitive parenting practices scores follow.

Child aggressive behaviour 1994: t = 3.28, p =.001
Child aggressive behaviour 2000: t = 0.70, p = .48
Punitive parenting practices 1994: t = 1.86, p = .06
Punitive parenting practices 2000: t = 0.01, p = .99

Region of residence. Region of residence at the time when the longitudinal outcome variables were measured (that is, in 2000) was used in the analyses that follow, as discussed in Appendix B. Mean differences among the five regions in child aggressive behaviour and punitive parenting practices in 1994 and in 2000, which appear in Table 2, were tested using t-tests. For each of the four variables, ten separate pairwise contrasts were tested, contrasting each of the five regions with each of the other four. Because multiple testing inflates Type 1 error, a Bonferroni adjustment was made, setting the individual alpha-levels for the ten tests for each dependent variable at alpha = .005. This procedure ensured an overall alpha of .05 for each dependent variable. The p-values for the regional contrasts appear in Table 3.

This table shows that in 1994, parents in Quebec reported aggressive behaviour scores for their children that were significantly lower statistically than scores in Ontario and the Prairie region at age 2 to 3 years. Quebec scores did not differ statistically from those for the Atlantic region or B.C. in this regard. In 2000, at ages 8 to 9 years, there were no statistically significant regional differences in reported aggressive behaviour in the children. The picture was different for punitive parenting practices. In 1994, when their children were aged 2 to 3, parents in Quebec reported punitive parenting practices scores that were significantly lower statistically than parents in the Atlantic region, Ontario, and the Prairie region, but not B.C. At the same time, parents in the Prairie region reported higher levels of punitive practices than the Atlantic region and B.C., in addition to Quebec. In 2000, when their children were aged 8 to 9, parents in Quebec reported punitive parenting practices scores that were significantly lower statistically than all of the other regions. Unlike 1994, the Prairie region did not differ statistically from any of the other regions in 2000, and no other statistically significant regional differences were found in 2000 in punitive parenting practices. A separate analysis[1] looked at the language of the interviews. The findings of that analysis were inconsistent with the proposal that interview language differences might have accounted for the differences in child aggressive behaviour scores and punitive parenting practices scores between Quebec and the other provinces.

Table 3
Table of p-values for contrasts among mean scores for child aggressive behaviour and punitive parenting practices in 1994 and 2000, for five regions of residence

	Region of residence				
	Atlantic	**Quebec**	**Ontario**	**Prairie**	**B.C.**
Child aggressive behaviour 1994					
Atlantic	-	0.01	0.72	0.24	0.64
Quebec		-	**0.00**	**0.00**	0.11
Ontario			-	0.43	0.43
Prairie				-	0.15
B.C.					-
Child aggressive behaviour 2000					
Atlantic	-	0.41	0.61	0.37	0.68
Quebec		-	0.65	0.11	0.29
Ontario			-	0.16	0.42
Prairie				-	0.78
B.C.					-
Punitive parenting 1994					
Atlantic	-	**0.00**	0.29	**0.00**	0.26
Quebec		-	**0.00**	**0.00**	0.07
Ontario			-	0.04	0.05
Prairie				-	**0.00**
B.C.					-
Punitive parenting 2000					
Atlantic	-	**0.00**	0.19	0.72	0.74
Quebec		-	**0.00**	**0.00**	**0.00**
Ontario			-	0.09	0.19
Prairie				-	0.96
B.C.					-

Note:
P-values in bold are significant at the .005 level.
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Child aggressive behaviour and punitive parenting practices. Table 4 presents the mean child aggressive behaviour scores for children living in punitive and non-punitive parenting environments in 1994 and 2000. These figures show that children in punitive situations were significantly more likely statistically to exhibit aggressive behaviour than those in non-punitive situations, both at age 2 to 3 years and at age 8 to 9 years. At age 2 to 3, children in punitive environments scored 39% higher on the scale of aggressive behaviours (mean score = 6.85) than did those in less punitive environments (mean score = 4.92). The difference was more pronounced six years later when the children were 8 to 9 years old. Those who lived in punitive homes scored 83% higher on the aggressive behaviour scale (mean score = 2.21) than those in less punitive homes (mean score = 1.21). Figure 1 illustrates these behaviour differences.

Table 4
Means (standard errors) of child aggressive behaviour scores for children in non-punitive and punitive parenting environments in 1994 and 2000

	Child aggressive behaviour score	
	Age 2-3 (1994)	Age 8-9 (2000)
Parenting environment		
Non-punitive	4.9 (.11)	1.2 (.06)
Punitive	6.9 (.24)	2.2 (.20)
All	5.2 (.10)	1.3 (.06)

Notes:
Total sample n=1,967.

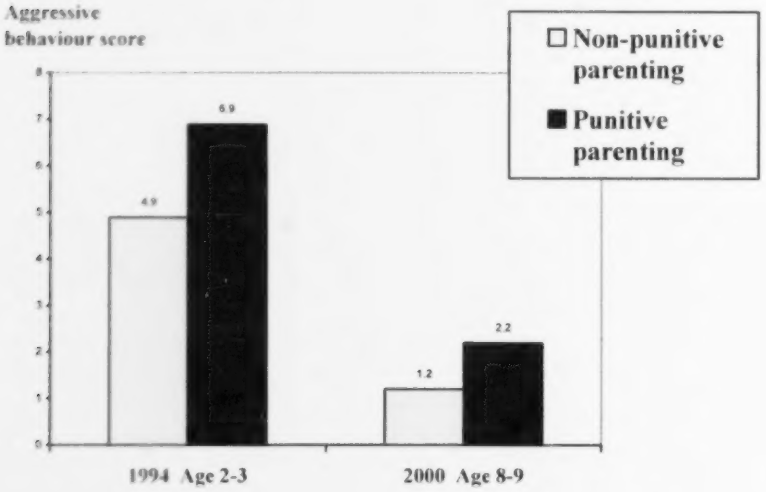
Observed ranges of scores were:
Child aggressive behaviour age 2-3 = 0 to 16 (maximum possible score = 16)
Child aggressive behaviour age 8-9 = 0 to 12 (maximum possible score = 12)

P< .05 for contrasts between non-punitive and punitive for both years.

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Child aggressive behaviour, parenting practices and child gender. Linear regression analyses undertaken for both 1994 and 2000 indicated that when the children were aged 2 to 3 years and when they were aged 8 to 9 years, punitive parenting practices predicted concurrent aggressive behaviour in the children but gender did not, when the punitive parenting practices of parents and the gender of the child were considered together. These findings indicate that for both ages, parents with higher punitive parenting practices scores were more likely than other parents to rate their children as aggressive. This difference was found regardless of the gender of the child. Therefore, gender was not considered further in the analyses of child aggressive behaviour and parenting practices in this report. The regression equations for these analyses appear in Table 5.

Figure 1
Means of child aggressive behaviour scores in 1994 and 2000 for children in non-punitive and punitive parenting environments



Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Table 5
Child aggressive behaviour score in 1994 and 2000 predicted by punitive parenting practices and gender: regression coefficients and standard errors of coefficients

	Child aggressive behaviour score			
	1994 (age 2-3)		2000 (age 8-9)	
Predictors	**B**	**Standard error**	**B**	**Standard error**
Constant	**2.917**	0.254	0.390	0.148
Punitive parenting 1994	**0.458**	0.042		
Punitive parenting 2000			**0.232**	0.030
Child gender	-0.233	0.201	-0.171	0.108

Notes:
Coefficients in bold differ from 0 at the .05 level.
B = unstandardized regression coefficient
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Child aggressive behaviour, parenting practices and income status. Linear regression analysis indicated that at age 2 to 3 years, when punitive parenting practices and income status were considered together, the two variables predicted child aggressive behaviour independently. That is, at age 2 to 3, low income was significantly linked with child aggressive behaviour after accounting for the effects of punitive parenting practices. However, by age 8 to 9, when punitive parenting and income status were considered together punitive parenting continued to predict child aggressive behaviour while income status did not. These findings indicate that for children in this age group, parents with higher punitive parenting practices scores were more likely than other parents to rate their children as aggressive, regardless of their income status. The regression equations for these analyses appear in Table 6. Income status was not considered further in the analyses of child aggressive behaviour and parenting practices in this report.

Table 6
Child aggressive behaviour score in 1994 and 2000 predicted by punitive parenting practices and income status: regression coefficients and standard errors of coefficients

	Child aggressive behaviour score			
	1994 (age 2-3)		2000 (age 8-9)	
Predictors	**B**	**Standard error**	**B**	**Standard error**
Constant	**2.661**	0.234	0.240	0.138
Punitive parenting 1994	**0.451**	0.042		
Household income 1994	**0.717**	0.278		
Punitive parenting 2000			**0.239**	0.030
Household income 2000			0.123	0.169

Notes:
Coefficients in bold differ from 0 at the .05 level.
B = unstandardized regression coefficient

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Child aggressive behaviour, parenting practices and region of residence. To examine whether region of residence and punitive parenting predicted child aggressive behaviour when they were considered together, region of residence was dummy-coded as a 2-level variable, non-Quebec and Quebec. This variable was used to study regional differences here because Quebec differed from all of the other regions in child aggressive behaviour at age 8 to 9 years, the outcome variable of interest, but there were no other inter-regional differences. Linear regression analyses indicated that both at age 2 to 3 years in 1994 and at age 8 to 9 years in 2000, when punitive parenting and region of residence were considered together, punitive parenting predicted child aggressive behaviour while region (non-Quebec vs. Quebec) did not. These findings indicated that parents with higher punitive parenting practices scores rated their children higher

in aggressive behaviour, regardless of whether their region of residence was Quebec or elsewhere. The regression equations for these analyses appear in Table 7. A detailed analysis[2] of the other regions of Canada confirmed that punitive parenting practices predicted child aggressive behaviour at both ages, regardless of region of residence.

Table 7
Child aggressive behaviour score in 1994 and 2000 predicted by punitive parenting practices and region of residence: regression coefficients and standard errors of coefficients

	Child aggressive behaviour score			
	1994 (age 2-3)		2000 (age 8-9)	
Predictors	**B**	**Standard error**	**B**	**Standard error**
Constant	**2.965**	0.268	0.266	0.142
Punitive parenting 1994	**0.446**	0.044		
Punitive parenting 2000			**0.237**	0.030
Region of residence (non-Quebec vs. Quebec)	-0.403	0.243	0.073	0.152

Notes:
Coefficients in bold differ from 0 at the .05 level.
B = unstandardized regression coefficient
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Change in parenting practices and child aggressive behaviour. The mean child aggressive behaviour score for each punitive parenting change category are presented in Table 8. These means are presented for both 1994 and 2000. The table suggests that current parenting practices were associated with current aggressive behaviour scores at both times, regardless of earlier parenting practices. Figure 2 illustrates the link between child aggressive behaviour in 2000 and the parenting style change categories.

Linear regression procedures were used to test the differences in child aggressive behaviour among the parenting change categories. The scores in 2000 were adjusted for the 1994 child aggressive behaviour scores in this set of analyses, and dummy-coded variables were used to test the parenting change category differences in the adjusted means[3] The results of these analyses are presented in Table 9. The regression coefficients reported in the table indicate that behaviour in 1994 predicted behaviour in 2000, as would be expected; that is, the regression coefficient for 1994 child aggressive behaviour of 0.165 differed from 0 at the .05 level of significance. Furthermore, the results of this analysis show that after controlling for child aggressive behaviour in 1994, the punitive parenting change variable predicted statistically significant

Table 8
Means (standard errors) of child aggressive behaviour scores in 1994 and 2000 for children in four punitive parenting change categories

Punitive parenting change category: 1994 to 2000	Child aggressive behaviour: Mean score		Population N
	1994 (age 2-3)	2000 (age 8-9)	
Non-punitive			
1994 and 2000	4.9 (.12)	1.2 (.07)	515,800
Changed to non-punitive			
1994 to 2000	6.5 (.29)	1.3 (.14)	69,400
Punitive			
1994 and 2000	7.7 (.39)	2.4 (.28)	24,900
Changed to punitive			
1994 to 2000	5.4 (.39)	2.2 (.25)	57,000
All	5.2 (.10)	1.3 (.06)	667,000

Notes:

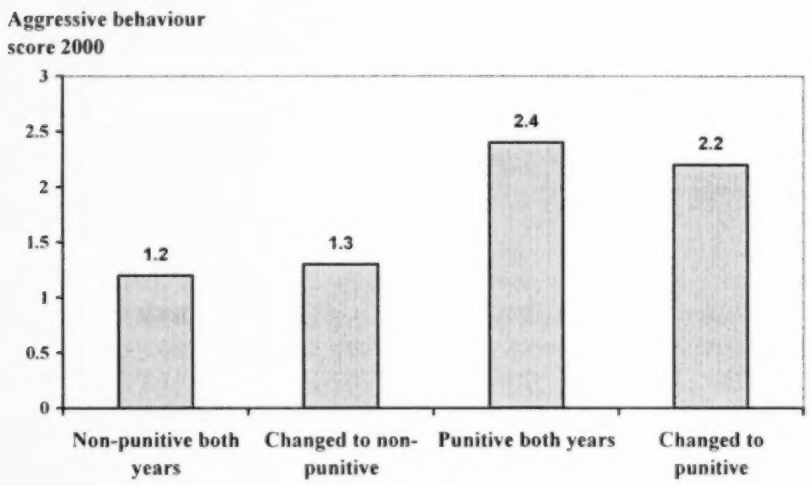
See text for definition of punitive parenting change categories.

Population N has been rounded to the nearest 100.

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

differences in child aggressive behaviour in 2000. Overall, children living in non-punitive parenting environments in 1994 and 2000 had significantly lower aggressive behaviour scores in 2000 than those whose environments were punitive at both times, after controlling for 1994 child aggressive behaviour. However, change in punitive parenting was linked with differences in behaviour outcome. Children whose parenting environments had changed from punitive to non-punitive between 1994 and 2000 had aggressive behaviour scores in 2000 that were just as low as those whose environment was non-punitive at both times. Those whose parenting environments had changed from non-punitive to punitive had aggressive behaviour scores in 2000 that were higher than both of these groups, and that were just as high as those whose environments were punitive at both times. In a separate series of tests, linear regression analyses using the behaviour and parenting scale scores, rather than the parenting change variable, found similar results.

Figure 2
Means of child aggressive behaviour scores in 2000 for children in four punitive parenting change categories



Source: National Longitudinal Survey of Children and Youth, 1994 and 2000

Table 9
Change in punitive parenting practices category from 1994 to 2000 predicting child aggressive behaviour score in 2000, controlling for 1994 child aggressive behaviour score: regression coefficients and standard errors

	2000 Child aggressive behaviour score (age 8-9)					
Predictors	**B**	**Standard error**	**B**	**Standard error**	**B**	**Standard error**
Child aggressive behaviour score 1994 (age 2-3)	**0.165**	0.018	**0.165**	0.018	**0.165**	0.018
Punitive parenting change contrasts						
(Constant)	**0.394**	0.099				
Non-punitive vs. changed to punitive	**0.864**	0.238				
Non-punitive vs. changed to non-punitive	-0.200	0.149				
Non-punitive vs. punitive	**0.674**	0.295				
(Constant)			**1.259**	0.245		
Changed to punitive vs. non-punitive			**-0.864**	0.238		
Changed to punitive vs. changed to non-punitive			**-1.064**	0.264		
Changed to punitive vs. punitive			-0.190	0.360		
(Constant)					0.194	0.170
Changed to non-punitive vs. non-punitive					0.200	0.149
Changed to non-punitive vs. changed to punitive					**1.064**	0.264
Changed to non-punitive vs. punitive					**0.874**	0.307

Notes:
Coefficients in bold differ from 0 at the .05 level.
See text for definition of punitive parenting change categories:
Non-punitive=non-punitive in 1994 and 2000
Changed to punitive=non-punitive in 1994, punitive in 2000
Changed to non-punitive=punitive in 1994, non-punitive in 2000
Punitive=punitive in 1994 and 2000
B = unstandardized regression coefficient
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

5. Discussion and conclusions

The research questions under investigation here have been at least partly answered by the analyses and results reported above. A brief discussion of the results that were relevant to each of the questions follows.

Does a parenting environment that includes punitive parenting practices predict concurrent aggressive behaviour in children?

Punitive parenting practices predicted child aggressive behaviour both in 1994, when the children were 2 to 3 years old, and in 2000, when they were 8 to 9 years old. As with all correlational data, these links do not imply causality. It is possible that punitive parenting practices resulted in more aggressive children, or that aggressive behaviour in children resulted in more punitive approaches to parenting. It is also possible that an underlying factor that was not considered in this analysis explains both the punitive approach of parents and the aggressive behaviour of their children. Because both variables were self-reported by the parent, one such underlying variable could be parental perception tendencies: those who tended to report themselves as being harsher might also have tended to interpret the child's behaviour as being more negative or aggressive than those who tended to report themselves as being less harsh or punitive. However, the relationships found here between punitive parenting and child aggression are consistent with a number of studies in the research literature reported earlier, including intervention studies, that concluded that harsh parenting does make an independent contribution to aggressive behaviour in young people.

Are the relationships between punitive parenting practices and child aggressive behaviour dependent on child gender, low income status, or region of residence, and/or do parenting practices alone predict behaviour after accounting for child gender, income status, and region?

The link between punitive parenting practices and child aggressive behaviour was found for both girls and boys, for low-income and higher-income households, and for Quebec and non-Quebec families. Parents with higher punitive parenting practices scores rated their children higher in aggressive behaviour than other parents, regardless of child gender, income status, or region of residence.

Does an early parenting environment that includes punitive parenting practices predict aggressive behaviour in children six years later, even when the parenting environment has become less punitive? Similarly, are links between non-punitive parenting practices and low levels of child aggressive behaviour persistent over six years when the parenting environment is the same at both times or when it has become more punitive?

Change in parenting practices between 1994 and 2000 was linked to differences in later behaviour. After controlling for aggressive behaviour at age 2 to 3 years, a non-punitive parenting environment at age 8 to 9 years predicted low aggressive behaviour scores at age 8 to 9 years, whether the parenting environment had been non-punitive or punitive at age 2 to 3 years. Similarly, after controlling for aggressive behaviour at age 2 to 3 years, a punitive parenting environment at age 8 to 9 years predicted high aggressive behaviour scores at age 8 to 9 years,

whether the parenting environment had been non-punitive or punitive at age 2 to 3 years. In other words, children whose early parenting environment had been punitive but whose environment became less so scored as low in aggressive behaviour as those whose parenting environment was non-punitive at both ages. Likewise, children whose early parenting environment had been non-punitive, with low reported punitive parenting, but whose environment became more punitive over the course of the six years, scored just as high in aggressive behaviour as those whose parenting environment was punitive at both ages.

These longitudinal findings expand what is known about the relationship between early home environments and later behaviour. The study confirmed the expected links between harsh, punitive parenting on the one hand and child aggressive behaviour on the other, both at age 2 to 3 years and at age 8 to 9 years. This relationship appeared for both child genders, for low-income and higher-income families, and for all regions of Canada. Notably, however, the study found that children who experienced change in parenting practices from 1994 to 2000 exhibited aggressive behaviour outcomes that differed from those who did not.

While these data do not demonstrate a causal link between punitive parenting and aggressive behaviour in children, they are consistent with earlier theory and research which have proposed that harsh, punitive parenting practices may lead to increased child aggressive behaviour (Ackerman, Brown and Izard 2003; Brown and Izard 2003; Conger et al. 1994; Deator-Deckard et al. 1996; Pettit, Bates and Dodge 1997). They are also consistent with findings that some children are resilient to threats to healthy development posed by early punitive situations, and demonstrate good outcomes despite early disadvantage (e.g., Ackerman, Brown and Izard 2003).

These are encouraging results in that they suggest that early disadvantage in the family environment does not necessarily imply poor outcomes later: parenting practices and aggressive behaviour in children may both change for the better, and improvement in one predicts improvement in the other. The findings are especially encouraging, given the known links between early aggression on the one hand and later delinquency, crime, and other negative outcomes on the other (Broidy et al. 2003; Koko and Pulkkinen 2000; Loeber and Hay 1997; Nagin and Tremblay 1999).

A future study will extend this research using data from the 2002/3 cycle of the NLSCY, when this group of children were 10 to 11 years old. The data from this cycle will be available for analysis late in 2004. Also, future studies will examine change in other dimensions of the home environment. The intention will be to investigate whether change in such variables as family functioning, maternal depression, and different dimensions of parenting predicts change in a variety of positive and negative outcomes for children, in addition to aggressive behaviour.

Endnotes

1. Regional differences may arise from social, cultural, or other differences. The most striking and persistent differences in the analyses reported here were those between Quebec and other regions of Canada. One possible explanation of this pattern relates to the language of the interview. Because the parents were interviewed in the language of their choice, it is possible that the language of interview affected parent report as a result of subtle meaning differences between the English and French survey instruments. In Quebec, 98% of the interviews were conducted in French in 2000, compared with 9% in the Atlantic region, 3% in Ontario, and 0% in the Prairie region and British Columbia. To investigate the possibility that biased survey instruments affected findings, the mean scores for child aggressive behaviour and punitive parenting practices were compared between French and English interviews in non-Quebec families. Because information about the language of interview was not available for the 1994 cycle, this analysis was undertaken only for the year 2000, when the children were 8 to 9 years old. Mean behaviour and parenting scores for English and French interviews in non-Quebec families in 2000 appear in Table 10. The mean for child aggressive behaviour was slightly higher for the French than the English families outside Quebec, although this difference was not statistically significant. The means for punitive parenting practices were almost identical between the French and English respondents. These findings are inconsistent with the proposal that interview language differences accounted for the differences in child aggressive behaviour and punitive parenting practices scores between Quebec and the other provinces. There were insufficient interviews conducted in English in Quebec to allow a parallel analysis of English-French differences there.

Table 10
Mean scores (standard errors) for child aggressive behaviour and punitive parenting practices by language of interview, for non-Quebec families in 2000

Language of interview (n)	Child aggressive behaviour 2000 age 8-9	Punitive parenting 2000
English (1,518)	1.4 (.06)	4.7 (.07)
French (57)	2.0* (.40)	4.6 (.48)
All (1,575)	1.4 (.06)	4.7 (.07)

Notes:
P >.10 for both contrasts.
Observed ranges of scores were:
Child aggressive behaviour age 8-9 = 0 to 12 (maximum possible score = 12)
Punitive parenting for age 8-9 = 0 to 11 (maximum possible score = 16)
* indicates a coefficient of variation (CV) between 16.6% and 25%
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 2000

2. Because there were regional differences in both child aggressive behaviour and parenting practices in 1994, the linear regression analyses in Table 7 were repeated for each of the other four regions. Child aggressive behaviour in 1994 was regressed on punitive parenting in 1994 and region of residence, which was entered as a dummy coded variable (Atlantic region vs. not Atlantic region; Ontario vs. not Ontario; Prairie region vs. not Prairie region; B.C. vs. not B.C.). A similar analysis was undertaken for 2000. In all cases, when punitive parenting and region of residence were considered together, punitive parenting predicted child aggressive behaviour while region did not. In a separate set of regression analyses, each possible pair of regions was entered as a set of dummy-coded variables, to compare regions one-on-one. Again, in every case region of residence did not predict child aggressive behaviour while punitive parenting did predict child aggressive behaviour. These results were found for 1994 (age 2 to 3) and for 2000 (age 8 to 9).

3. To explore all six adjusted pairwise behaviour differences among the four levels of the parenting change variable, three separate, but equivalent, regression analyses were completed. In each regression, pairwise differences were represented by three two-level dummy-coded variables, and the statistical significance of each adjusted pairwise difference was ascertained by testing the regression coefficient associated with the pairwise contrast of interest. Using this procedure, the first regression analysis yields three adjusted pairwise comparisons, the second yields two, and the third yields the final comparison.

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Appendix A. The National Longitudinal Survey of Children and Youth

Survey objectives. The National Longitudinal Survey of Children and Youth (NLSCY) is a long-term study of Canadian children that follows their development from birth to early adulthood. The NLSCY began in 1994 and is jointly conducted by Statistics Canada and Social Development Canada. The survey is designed to collect information about factors influencing the social, emotional and behavioural development of children, and to monitor the impact of these factors on their development over time. The survey covers a broad range of topics including health, physical development, learning, behaviour, and social environment (family, friends, schools and communities).

Survey design. The NLSCY sample frame in the first cycle of the survey, in 1994/5, was based on the Labour Force Survey (LFS), a monthly survey of households in Canada conducted by Statistics Canada. Households with children aged 0 to 11 years old were selected from the LFS in 1994 to participate in the NLSCY. Of 26,000 eligible households, 23,000 responded.

The first cycle of the NLSCY was conducted in 1994 and early 1995. The longitudinal cohort from that cycle has been monitored every two years since then, with data collection taking place in 1994/95, 1996/97, 1998/99, 2000/01, 2002/03. New panels of children have been added to the survey each year, but the present study was based on the original longitudinal panel. Data were available for cycles 1 to 4 at the time of writing. Data from the fifth cycle (2002/03) will be available in late 2004.

For children under 16 years of age, most of the information in the survey is provided by the person most knowledgeable about the child (the PMK), usually the mother. She provides information about herself, the household and family, and the child. In addition, children 10 and over provide some information about themselves on a self-completed questionnaire. Direct measures of the child's abilities may also be taken, depending on the child's age. School teachers and principals also complete a survey, again depending on the age and school status of the child, and on whether permission is given by the parent.

The present sample. The children studied here were members of the first longitudinal cohort of the NLSCY. The sub-group of interest were those who were born in 1991 and 1992. Most of these children were aged 2 to 3 years during the 1994/95 data collection phase of the survey (referred to as 1994 in this report) and aged 8 to 9 during the 2000/01 collection phase (referred to as 2000 in this report).

Altogether 2,306 children born in 1991 and 1992 were included in the 1994 and 2000 longitudinal sample. The definition of age in the NLSCY was changed from the 1994 cycle to the 2000 cycle. In 2000, age was defined as the year of birth subtracted from the reference year (2000). This was the age used for weighting the longitudinal sample. However, in 1994 the exact age at the time of interview was used to determine the questions to be asked of the children. Because of this conceptual difference, 59 children who were considered to be 2-year-olds in 1994 according to their birth year were not 2 at the time of interview and were not asked the questions. Similarly, 79 children who were considered to be 3-year-olds in 1994 were over 3 at the time of interview and were not asked the relevant questions, leaving a final total sample of

2,168 children. Applying the survey design weights indicates that these children represented 754,100 children of similar age in the Canadian population in this age group. The analyses included in this report were undertaken on those children for whom scores were available on all of the variables of interest. A total of 201 children, 9.3% of the sample, representing 87,100 children (11.5%) in the Canadian population, were excluded from the analyses because data were not available for at least one of the variables. The remaining sample of 1,967 children represented 667,000 children in the Canadian population. A partial non-response analysis was undertaken for the variables of interest, to guide the interpretation of findings. The non-response analysis appears in Appendix C. Forty-five of the households in this sub-group contained two children who were in the appropriate age group, and both children were retained in the analyses.

Appendix B. Definitions and concepts

Demographic variables

Child gender and age. Demographic variables of interest included child gender, and age at each stage of the survey (whether 2 or 3 years old in 1994/95 and 8 or 9 years old in 2000/01).

Household income status. Income status was measured using the income ratio variable in the data set, which is the ratio of household income to the low-income cut-off (LICO) level as reported by Statistics Canada for the size and location of the child's household. The following information on the income ratio variable was taken from the *Microdata User Guide* of the NLSCY for cycle 1 (Statistics Canada n.d.a).

> *NLSCY children can be classified as living in households of various income levels. An income ratio has been derived and assigned to each child record and can be used for analytical purposes to further understand the economic situation of the child. The following is a description of how this ratio was calculated.*
>
> *Every year Statistics Canada establishes what are known as the low-income cut-offs, which are derived by considering expenditure to income patterns observed in the most recent Family Expenditure Survey. These thresholds or values are calculated for different urban-size and family-size categories and are updated annually using the Consumer Price Index.*
>
> *The cut-offs that were derived for 1994 were used to calculate the NLSCY income ratio. The ratio was simply calculated to be the household income divided by the cut-off value (p.63-64).*

Similar procedures were used to calculate the NLSCY income ratio for 2000. Readers who require additional information on data quality issues related to the income ratio are referred to the *Microdata User Guide* for the NLSCY for cycle 1 or cycle 4 (Statistics Canada n.d.a, n.d.b).

Income status in the present report was analyzed as a two-level variable, low income (ratio of income to LICO was less than 1) and not low, or higher, income (ratio of income to LICO was equal to or greater than 1).

Region of residence. The ten provinces were grouped into five regions for this analysis: 1) Atlantic region, including Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick; 2) Quebec; 3) Ontario; 4) Prairie region, including Manitoba, Saskatchewan and Alberta; and 5) British Columbia. Analyses were also undertaken comparing Quebec region with non-Quebec residence; i.e., the rest of Canada. An examination of region of residence in 1994 and 2000 indicated that this variable was stable for the population under study. The percentage of respondents in 2000 in the sub-sample of interest who were residing in the same region as in 1994 was 95% or more in each of the five regions: Atlantic region 98%; Quebec 100%; Ontario 98%; Prairie region 95%; and British Columbia 96%. Therefore, the region of residence in 2000 was used for all analyses in this report.

Parenting environment predictor variables

Punitive parenting practices scales. The parenting practices variables in the survey were measured using scales that included responses to a set of individual items. The parenting scales of interest in this study were the measures of punitive parenting management practices, which were collected at both time points, age 2 to 3 and age 8 to 9. The items were included in the punitive parenting practices scale on the basis of a factor analysis undertaken by Statistics Canada of several questionnaire items. The Cronbach's alpha measure of internal reliability for this scale, as calculated by Statistics Canada, was 0.55. For further details about the punitive parenting scale, the reader is referred to the *Microdata User Guide* for the NLSCY for cycle 4 (Statistics Canada n.d.b).

Each of the scales included responses to four questions. Wording differed very slightly between the two cycles. The wording presented here is that used in the 2000 cycle. Parents were asked:

How often do you, as his/her parent, do each of the following:

- *Raise your voice, scold, or yell at him/her?*
- *Calmly discuss the problem?*
- *Use physical punishment?*
- *Describe alternative ways of behaving that are acceptable?*

Response options were: *always, often, sometimes, rarely,* and *never*. The first and third items in the list received a score of 4 for *always*, 3 for *often*, 2 for *sometimes*, 1 for *rarely*, and 0 for *never*. Response values were reversed for the second and fourth items. Possible scores for this scale ranged from 0 (low punitive) to 16 (high punitive) for 1994 and 2000.

Two-level punitive parenting practices variables. Two-level punitive parenting variables were created from the punitive parenting scales, one for each time point. The frequency distributions of the punitive parenting scales in 1994 and 2000 for the sample under study were divided into two categories, one labelled "non-punitive" and the other labelled "punitive". The intention was to select a division point on the scales such that the percentage of cases falling in the punitive category would be as close as possible to ten per cent. In practice, for 1994 at age 2 to 3 years, a score of 7 was selected as the division point. Approximately 86% of the children had scores of 7 or lower, the non-punitive category, while 14% had scores of 8 or higher, the punitive category. Similarly, for 2000 at age 8 to 9 years, a score of 6 was selected as the division point. Approximately 88% of the children had scores of 6 or lower, the non-punitive category for this stage, while 12% had scores of 7 or higher, the punitive category.

Parenting environment change variable

To study change in the parenting environment, a 4-level parenting change variable was computed using the two-level punitive parenting practices variables. Each child was categorized into one of four parenting change categories as follows:

Parenting Change Categories:

1. Non-punitive 1994 and 2000: These were cases where the punitive parenting practices score was in the non-punitive range both in 1994 and in 2000.
2. Changed to punitive 1994 to 2000: These were cases where the punitive parenting practices score was in the non-punitive range in 1994 but in the punitive range in 2000.
3. Changed to non-punitive 1994 to 2000: These were cases where the punitive parenting practices score was in the punitive range in 1994 but in the non-punitive range in 2000.
4. Punitive 1994 and 2000: These were cases where the punitive parenting practices score was in the punitive range in both 1994 and 2000.

It should be noted that the parenting change variable depended on scores that were relative to the scores of other parents in 1994 and 2000. It would be possible for an individual's punitive practices to be unchanged or even to decrease from one time to the next, but for them to move from the non-punitive to the punitive category because of an overall decrease in the sample mean for the parenting practices score from 1994 to 2000. The punitive parenting change variable must be interpreted in relative terms. For example, the family environment could change from non-punitive relative to others at time 1 to punitive relative to others at time 2. The analyses in this report look at relative, not absolute, change.

Child aggressive behaviour

The externalizing behaviour variable of interest in this analysis was child aggressive behaviour. In the 1994 survey, a series of questions about physical aggression and oppositional behaviour was included for children aged 2 and 3 years. In 2000, a series of questions about physical aggression and conduct disorder problems was included for children aged 4 to 11 years. Although the scales for 1994 and for 2000 assess a similar underlying concept, namely, aggressive tendencies in child behaviour, they are based on different questions, and the numbers of items in the scales also differ. Therefore, the child aggressive behaviour scores at age 2 to 3 and age 8 to 9 are not directly comparable.

For both cycles, the questions were answered by the person most knowledgeable about the child, usually a parent. The questions were drawn from a number of sources, as described in the NLSCY *Microdata User Guide* for each of the cycles (Statistics Canada n.d.a, n.d.b).

For children aged 2 to 3 years in 1994, a factor analysis identified eight questions contributing to an aggressive behaviour scale that was appropriate for the age group. Details of the factor analysis appear in the *Microdata User Guide* for the NLSCY for cycle 1 (Statistics Canada n.d.a). The Cronbach's alpha measure of internal reliability for this scale, as calculated by Statistics Canada, was 0.75. The questions contributing to the scale for 2- to 3-year-olds follow.

How often would you say that he/she

1. *Is defiant?*
2. *Gets into many fights?*
3. *Punishment doesn't change his/her behaviour?*
4. *Has temper tantrums or hot temper?*
5. *Has difficulty awaiting turn in games or groups?*
6. *When another child accidentally hurts him/her, assumes that the other child meant to do it, and then reacts with anger and fighting?*
7. *Has angry moods?*
8. *Kicks, bites, hits other children?*

Response options were: *never or not true*, *sometimes or somewhat true*, and *often or very true*. Items received a score of 0 for *never or not true*, 1 for *sometimes or somewhat true*, and 2 for *often or very true*. Possible scores for the child aggressive behaviour scale for 1994 ranged from 0 (low aggression) to 16 (high aggression).

For children aged 4 to 11 years in 2000, when the sampled children were aged 8 to 9, a factor analysis identified six questions contributing to an aggressive behaviour scale that was appropriate for the age group. Details of the factor analysis appear in the *Microdata User Guide* for the NLSCY for cycle 4, (Statistics Canada n.d.b). The Cronbach's alpha measure of internal reliability for this scale, as calculated by Statistics Canada, was 0.77. The six questions contributing to the cycle 4 scale relevant for 8- to 9-year-olds follow.

How often would you say that he/she:

1. *Gets into many fights?*
2. *When another child accidentally hurts him/her, he/she reacts with anger and fighting?*
3. *Physically attacks people?*
4. *Threatens people?*
5. *Bullies or is mean to others?*
6. *Kicks, bites, hits other children?*

Response options were: *never or not true*, *sometimes or somewhat true*, and *often or very true*. As for the 1994 scale, items received a score of 0 for *never or not true*, 1 for *sometimes or somewhat true*, and 2 for *often or very true*. Possible scores for the child aggressive behaviour scale for 2000 ranged from 0 (low aggression) to 12 (high aggression).

Appendix C. Data analysis

Coefficient of variation. The coefficient of variation (CV) is a relative measure of variability, that can be used to compare the quality of estimates. It is calculated by dividing the square root of the variance of the estimate, by the estimate itself. Note that the square root of the variance is also known as the **standard error**.

Estimates with CVs of 16.5% or lower are considered to be of acceptable quality by Statistics Canada, and can be released without warning. Estimates with CVs in the range of 16.6% to 33.3% are of marginal quality, and should be accompanied with a warning about the relatively high levels of error. Estimates with CVs in excess of 33.3% are considered to be of unacceptable quality by Statistics Canada. Almost all CVs in the present report were in the acceptable range. The small number of estimates in the marginal range have been flagged in the tables.

Bootstrap weights for variance estimation. The following information was taken from the *Microdata User Guide* of the NLSCY for cycle 4 (Statistics Canada, n.d.b.).

> *It is almost impossible to derive an exact formula to calculate the variance for the NLSCY, due to the complex sample design, non-response adjustments and the post-stratification. A very good way to approximate the true variance is to use the Bootstrap method. A set of 1000 Bootstrap weights is available. Variance calculation using these 1000 Bootstrap weights involves calculating the estimates with each of these 1000 weights and then calculating the variance of these 1000 estimates (p. 136).*

The variances and standard errors of all estimates in the present study were calculated using the bootstrap weights that were developed by Statistics Canada for the 1994 longitudinal sample.

Descriptive statistics. In this report, descriptive statistics were presented on basic demographic variables for the sub-group under study. In addition, means were reported for child aggressive behaviour and punitive parenting scores in 1994 and 2000, by gender, income status, and region of residence. Estimates of means were calculated using the longitudinal sample design weights, and the statistical significance of differences between means was tested using regression analysis procedures, with the independent variables being entered into the regression equations as dummy-coded variables. The standard errors of the means and regression coefficients were estimated using the appropriate bootstrap weights for the 1994 longitudinal sample.

Longitudinal analyses. Longitudinal analyses were undertaken to examine the relationships among the predictor and outcome variables in an attempt to answer the research questions of this project. Linear regression analysis procedures were used, regressing the 2000 behaviour outcome variable on the 1994 behaviour variable and on the four-level punitive parenting change predictor variable. The purpose of this analytical approach was to test differences in mean aggressive behaviour scores at age 8 and 9 among the four parenting change groups, after the mean scores had been adjusted for the aggressive behaviour scores of the children at age 2 and 3. In this way it was possible to investigate whether *change* in parenting was linked to differences in child aggressive behaviour after the six-year period. The standard errors of the regression coefficients were estimated using the appropriate bootstrap weights for the 1994 longitudinal sample.

Analysis of Partial Non-response. Children for whom at least one of the aggressive behaviour or punitive parenting practices scores was missing were excluded from this analysis. To be included in the study as a respondent, all four scores were required. A comparison of the included and excluded children found no statistically significant differences between them in gender, age in 1994, region of residence, or income in 2000. Included and excluded children did differ in age in 2000 (respondents were older); and income in 1994 (respondents were less likely to be low income). These differences, which appear in Table C1, must be kept in mind in interpreting findings.

Of the 87,100 children who were excluded from the analysis because of one or more missing scores, 50,600 had a score for child aggressive behaviour in 1994, 52,200 for child aggressive behaviour in 2000, 68,100 for punitive parenting practices in 1994, and 46,600 for punitive parenting practices in 2000. In an effort to understand how this partial non-response might affect results, the included respondents were compared with the excluded on each of these four variables. The mean scores for included and excluded cases are presented in Table C2. No statistically significant differences were found in the mean child aggressive behaviour scores or parenting practices scores at either time, despite the demographic differences noted above.

Table C1
Percentage (standard error) and number of children by demographic category: included and excluded cases

		Included cases			Excluded cases		
		%	(SE)	Population N	%	(SE)	Population N
Child gender	F	49.2	(0.75)	328,400	47.1	(4.75)	41,000
	M	50.8	(0.75)	338,600	52.9	(4.75)	46,000
Child age 1994	2 years	46.5	(1.11)	310,100	51.1	(4.98)	44,500
	3 years	53.5	(1.11)	357,000	48.9	(4.98)	42,600
Child age 2000	8 years	**48.7**	(0.74)	324,800	**61.4**	(4.72)	54,500
	9 years	**51.3**	(0.74)	342,200	**38.6**	(4.72)	33,600
Household income 1994	Low	**24.7**	(1.67)	165,000	**37.4**	(5.35)	32,600
	Not low	**75.3**	(1.67)	502,000	**62.6**	(5.35)	54,500
Household income 2000[1]	Low	17.7	(1.66)	114,800	29.4*	(5.59)	24,600
	Not low	82.3	(1.66)	535,300	70.6	(5.59)	59,000
	(missing)			(16,900)			(3,400)
Region of residence 2000	Atlantic	7.6	(0.24)	50,900	6.6*	(1.33)	5,800
	Quebec	24.7	(0.62)	164,500	19.5*	(3.81)	17,000
	Ontario	36.9	(0.89)	246,000	41.9	(5.15)	36,500
	Prairie	19.0	(0.60)	126,800			
	B.C.	11.8	(0.55)	78,700	31.9[2]	(3.21)	27,800[2]
All cases		100.0		667,000	100.0		87,100

Notes:
Bold type indicates statistically significant differences between included and excluded cases ($p < .05$).
Total sample n = 1,967 included; 201 were excluded.
Population N has been rounded to the nearest 100.
* indicates a coefficient of variation (CV) between 16.6% and 25%
1. Low income cut-off was not available for a small number of children in 2000.
2. Regions were combined because of small cell numbers.
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Table C2
Means (standard errors) of child aggressive behaviour scores and punitive parenting scores for included and excluded cases

	Child aggressive behaviour				Punitive parenting 1994			
	1994 (age 2-3)		2000 (age 8-9)		1994		2000	
	Mean score	Population N	Mean score	Population N	Mean score	Population N	Mean score	Population N
Included	5.2 (.10)	667,000	1.3 (.06)	667,000	5.2 (.08)	667,000	4.4 (.06)	667,000
Excluded	5.2 (.32)	50,600	1.5* (.35)	52,200	4.9 (.28)	68,100	4.3 (.34)	46,600

Notes:
Differences were not statistically significant at the .05 level.
Observed ranges of scores were:
Child aggressive behaviour age 2-3 = 0 to 16 (maximum possible score = 16)
Child aggressive behaviour age 8-9 = 0 to 12 (maximum possible score = 12)
Punitive parenting for age 2-3 = 0 to 13 (maximum possible score =16)
Punitive parenting for age 8-9 = 0 to 11 (maximum possible score =16)
* indicates a coefficient of variation (CV) between 16.6% and 25%
Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994 and 2000

Appendix D. Frequency tables

Table D1.
Percentage of children by score on the child aggressive behaviour scale: age 2 to 3 years

Score on aggressive behaviour scale for 2- to 3-year-olds	Percentage	Standard error
0 (low)	3.9 *	0.80
1	6.8	0.87
2	10.3	1.07
3	12.0	1.07
4	14.1	1.33
5	10.7	1.04
6	9.6	1.01
7	9.7	1.04
8	7.8	0.97
9	4.3	0.73
10	5.0 *	0.94
11	2.1 *	0.42
12	2.3 **	0.62
13 and over (high)	1.3	0.17

Notes:
Total sample n=1,967; population N = 667,000.
Observed range of scores: 0 to 16 (maximum possible score =16)

* indicates a coefficient of variation (CV) between 16.6% and 25%

** indicates a coefficient of variation (CV) between 25% and 33.3%

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994

Table D2
Percentage of children by score on the child aggressive behaviour scale: age 8 to 9 years

Score on aggressive behaviour scale for 8- to 9-year-olds	Percentage	Standard error
0 (low)	45.0	1.83
1	22.2	1.44
2	14.0	1.22
3	7.2	0.91
4	4.1	0.65
5	3.6	0.56
6	2.0 *	0.43
7 and over (high)	1.9	0.23

Notes:

Total sample n=1,967; population N = 667,000.

Observed range of scores: 0 to 12 (maximum possible score =12).

* indicates a coefficient of variation (CV) between 16.6% and 25%

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 2000

Table D3

Percentage of children by score on the punitive parenting practices scale: age 2 to 3 years

Score on punitive parenting practices scale	Percentage	Standard error
0 (low)	1.1 *	0.25
1	3.5 *	0.76
2	6.0	0.85
3	9.7	1.12
4	20.3	1.50
5	15.8	1.36
6	16.9	1.31
7	12.6	1.09
8	7.3	0.86
9	2.9	0.45
10	2.0 *	0.42
11 and over (high)	2.0	0.29

Notes:

Total sample n=1,967; population N = 667,000.

Observed range of scores: 0 to 13 (maximum possible score =16).

* indicates a coefficient of variation (CV) between 16.6% and 25%

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 1994

Table D4

Percentage of children by score on the punitive parenting practices scale: age 8 to 9 years

Score on punitive parenting practices scale	Percentage	Standard error
0 (low)	2.3 *	0.43
1	4.3	0.66
2	9.6	1.16
3	14.1	1.24
4	23.0	1.49
5	17.2	1.33
6	17.4	1.25
7	7.4	0.89
8	2.6 *	0.45
9 and over (high)	2.3 *	0.39

Notes:

Total sample n=1,967; population N = 667,000

Observed range of scores: 0 to 11 (maximum possible score =16).

* indicates a coefficient of variation (CV) between 16.6% and 25%

Source: Statistics Canada: National Longitudinal Survey of Children and Youth, 2000